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Original article

The protective effect of kiwi fruit extract against to chromium effect on protein expression in *Saccharomyces cerevisiae*

Abdullah Aslan[1], Ozlem Gok[2], Orhan Erman[2]

[1] Firat University, Faculty of Science, Department of Molecular Biology and Genetics, Elazig, Turkey - E-mail: aaslan@firat.edu.tr; [2] Firat University, Faculty of Science, Department of Biology, Elazig-Turkey

Summary. In this study, five groups were composed. i: Control group, ii: $K_2Cr_2O_7$ group, iii: 10 mM $K_2Cr_2O_7$+ kiwi juice (KWJ) group, iv: 20 mM $K_2Cr_2O_7$ + KWJ group, v: 25 mM $K_2Cr_2O_7$ + KWJ group. After sterilization, fruit juice (20%) and $K_2Cr_2O_7$ were added different concentration to *Saccharomyces cerevisiae* (*S. cerevisiae*) cultures and the cultures were growned at 30°C for 1h, 3h, 5h and 24 hours [overnight (ON)]. *S. cerevisiae* cell growth was determined by spectrophotometer, total protein changes was detected by SDS-PAGE electrophoresis and reckoned with Bradford method. According to our studies results; cell growth rised in KWJ groups to which KWJ was taken in comparison to the positive control ($K_2Cr_2O_7$) group at different growing times (1, 3, 5 and 24 hours) ($p<0,05$). As a result KWJ has a protecting for decrease the oxidative damage and increased cell growing and induced protein synthesis in *S. cerevisiae* culture.

Key words: kiwi fruit juice, SDS-PAGE, protein, chromium, oxidative damage, cell growth

Introduction

Nowadays alot of researchers indicated that consumption of fruits lead to prevention and remedy of different diseases (1). The kiwi fruit (*Actinidia deliciosa*) arised in Asia and it has rich nutritional properties, such as minerals and bioactive compounds and it has very important antioxidant activity. These contents decrease of lipid peroxidation reactions (2, 3). In recent years, kiwi fruit, strawberry, pomegranate, peach, cherry fruit, is consumed as fresh as many antioxidant activity, which has been proven to work done. In addition, these fruit were used by alot of researchers for antioxidan origin. (4-7). The need for fruit juice proceeds to increase in recent years owing to consumer requests. The reasons for this rising in demand are the facts that these fruits are sources of antioxidants, minerals and vitamins. In addition, inhibition of elements that threaten the health of individuals such as cardiovascular diseases, cancer or diabetes is another factor (1, 8, 9). Reactive oxigen species (ROS) can affect to nucleic acid, protein, fat and carbohydrates. for example, the oxidative injury to proteins cause prevention of amino acid chains reducing the biologic activity. Under normal conditions, oxidative damage are prevented by antioxidant defenses. In addition, under abnormal conditions, antioxidant defense system is insufficient and lead to oxidative damage in cell. (10-13). Chromium is very toxic matter for microorganisms and some livings. It can also be effective on the cell since it is transported in the prokaryote and eukaryote living (14). It has been indicated by different studies that kiwi and grapefruit is especially rich with regard to polyphenol content. It is also demontsrated that kiwi is especially a potent antifungal, antiviral, antibacterial fruit (3, 8, 15, 16). A lot of microorganisms are applied as models in scientific studies, particularly *Escherichia coli* and *S. cerevisiae* are usually preferred because their genetic structures are known (17). According to results of many studies various fruit content increase cell de-

velopment, defends the yeast from apoptosis, encourages protein synthesis thus increasing the chance of the yeast to remain strong against metabolic products in *S. cerevisiae* that has been subject to chemical agents (oxidative stress) (5,11). In this study, various concentration of chromium matter prepared and it has been transferred to *S. cerevisiae* culture after which the effects of kiwi plant in this living thing against to cell growing have been examined.

Material and Methods

Research groups

Five groups were formed in this study. i: Control group, ii: $K_2Cr_2O_7$ group, iii: 10 mM $K_2Cr_2O_7$+ KWJ group, iv: 20 mM $K_2Cr_2O_7$ + KWJ, v: 25 mM $K_2Cr_2O_7$ + KWJ group. After sterilization, fruit juice (20%) and $K_2Cr_2O_7$ were inserted different concentration to *Saccharomyces cerevisiae* (*S. cerevisiae*) cultures and the cultures were developed at 30^{0}C for 1h, 3h, 5h and 24 hours (overnight). Occurrence media of *S. cerevisiae*: For the developed and reproduce of yeast, YEPD (for 50 mL 1.5 g yeast extract, 1.5 g trypton, 1.5 g glucose) in addition, for the growth and reproduce of *S. cerevisiae*, fruit juices was inserted and developed. After sterilization, samples were incubated for 1h, 3h, 5h, 24 h (overnight, h: hour) at 30˚C. Kiwi fruit juice extract and $K_2Cr_2O_7$ Chemical Fruit (From center county of Elazığ city) was squashed in water and added in to *S. cerevisiae* media cultures and added 20% (v/v) ratio in at the reproducing for 30^{0}C. $K_2Cr_2O_7$ was added in $K_2Cr_2O_7$ and KWJ+ $K_2Cr_2O_7$ groups (8).

Kiwi fruit juice extract and $K_2Cr_2O_7$ Chemical

Fruit (From center county of Elazig city) was squashed in water and added in to *S. cerevisiae* media cultures and added 20% (v/v) ratio in at the reproducing for 30^0 C, $K_2Cr_2O_7$ was added in $K_2Cr_2O_7$ and KWJ+ $K_2Cr_2O_7$ groups.

Cell intensity measurements

In these calculations, culture samples that were developed at 30^{0}C for 1, 3, 5 hours and overnight (24 hours) have been analyzed. The measurement has been carried out using a spectrophotometer at 600nm (OD_{600}).

SDS-PAGE (Sodium Dodecyl Sulfate Polyacrylamide gel electrophoresis) analysis

The samples *of S. cerevisiae* cultures were prepared for SDS-PAGE after which they were loaded to sample loading wells to be subject to electrical current and after this process the gels were dyed, their images were taken and the intergroup protein bandings were used as data in the study (18).

Protein density measurements

The calculation has been realised using a spectrophotometer at 595nm (OD_{595}) according to bradford method. BSA protein standards at different concentrations were obtained using BSA protein. Accordingly, the total protein amount in *S. cerevisiae* groups corresponding to this standard value was calculated (figure 1, figure 2, table 1).

Statistical analysis

For statistical analysis the SPSS 20.0 software was used. The comparison between experimental groups and

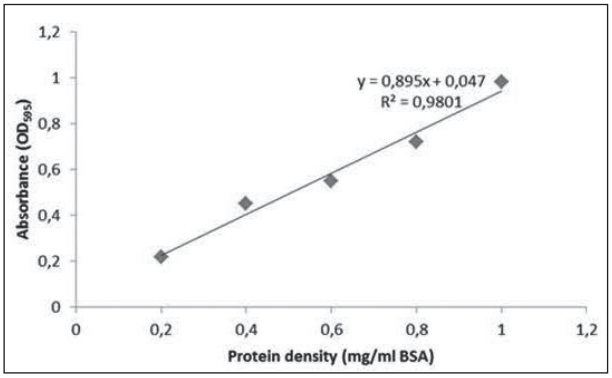

Figure 1. Bradford BSA (bovine serum albumin) standart graph

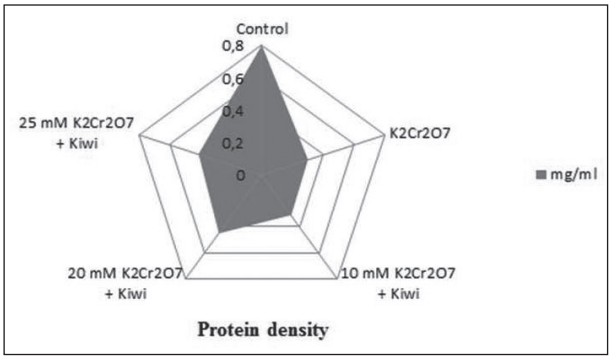

Figure 2. Protein densities of among the groups.

the control group was made using one way Anova Post Hoc Games-Howell and Duncan test. Statistically significant differences among groups have been stated as $p<0.05$, standard deviations were indicated as ±.

Results and Discussion

We expect that the results of this study will lead a significant reference for future academical studies. According to our results in Table 2 and Figure 4, it is observed that there is a statistically significant difference between groups with different development times ($p<0.05$). It can be observed that the kiwi extract transferred to the culture environment maintains cell development against the negative effect of chromium and at times even increase it. When the bradford protein results given in Table 1 and Figure 2 are examined, we can say that kiwi extract encourages protein synthesis in the *S. cerevisiae*. It is especially viewed that protein intensity has rised highly in 20 mM $K_2Cr_2O_7$ + KWJ and 25 mM $K_2Cr_2O_7$ + KWJ in comparison with the control. When the SDS-PAGE gel image in Figure 3 is examined; it is seemed that protein band density has increased statistically significantly in groups to which kiwi fruit content has been administered in proportion to the control group. We had obtained like results in previous studies appliyed on *S. cerevisiae* with fruits

Table 1. Bradford protein density

OD_{595} (30°C)	mg/ml
Control	0.8
$K_2Cr_2O_7$	0.3
10mM $K_2Cr_2O_7$ + Kiwi	0.31
20mM $K_2Cr_2O_7$ + Kiwi	0.45
25mM $K_2Cr_2O_7$ + Kiwi	0.41

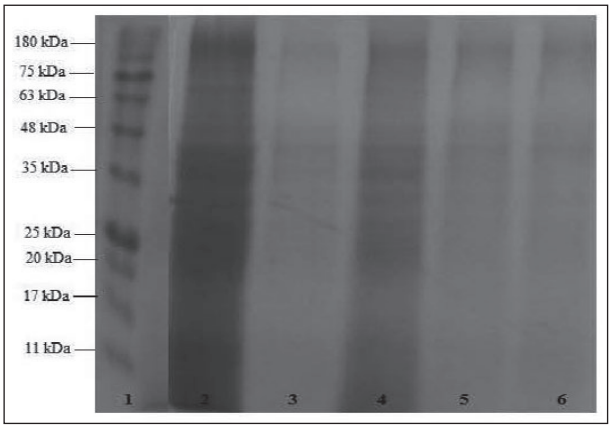

Figure 3. SDS-PAGE pelet total protein bands profiles for development at 30°C. Lanes 1: Marker; 2: Control; 3: K2Cr2O7; 4: 10 mM K2Cr2O7 + Kiwi; 5: 20 mM K2Cr2O7 + Kiwi; 6: 25 mM K2Cr2O7 + Kiwi.

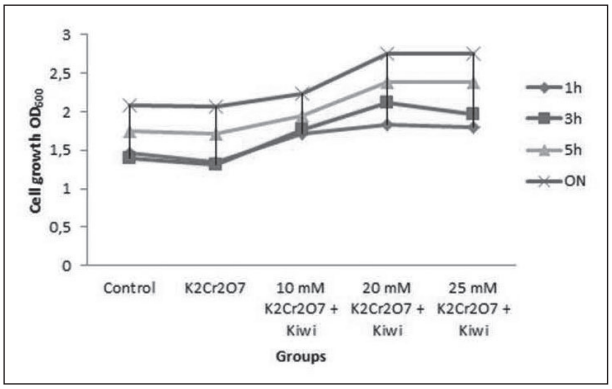

Figure 4. The growing of *Saccharomyces cerevisiae* in KWJ at different hours

Table 2. *Saccharomyces cerevisiae* cell growth in kiwi fruit juices

	1h	3h	5h	ON
Control	1,47 ± 0,00^{b}	1,39 ± 0,00^{b}	1,75 ± 0,00^{b}	2,09 ± 0,00^{a}
$K_2Cr_2O_7$	1,34 ± 0,12^{a}	1,32 ± 0,04^{a}	1,71 ± 0,01^{a}	2,07 ± 0,03^{a}
10 mM $K_2Cr_2O_7$ + Kiwi	1,71 ± 0,04^{c}	1,77 ± 0,03^{c}	1,95 ± 0,00^{c}	2,24 ± 0,00^{b}
20 mM $K_2Cr_2O_7$ + Kiwi	1,84 ± 0,04^{e}	2,12 ± 0,05^{e}	2,39 ± 0,00^{d}	2,76 ± 0,00^{c}
25 mM $K_2Cr_2O_7$ + Kiwi	1,79 ± 0,04^{d}	1,96 ± 0,00^{d}	2,39 ± 0,00^{d}	2,75 ± 0,00^{c}

***^{a,b,c,d,e}among the groups which bearing of different letter are significant ($p<0.05$).*
One way Anova Post Hoc Games-Howell and Duncan test

such as pomegranate juice, apple juice, cherry, sour cherry etc. We had watched in the study during which kiwi juice was given that kiwi juice increased *S. cerevisia*e development and thus was protective against oxidative damage in the yeast despite the negative effects of the chromium. Leontowicz et al (2016) and Wang et al (2017) have put forth that kiwi fruit is an antioxidant and that it also protects fruits and vegetables against yeast and are benefical to human health (3,7). Contrary to the results acquired in different studies, it has been emphasized that *S. cerevisiae* development in grapefruit under high pressure regresses which can be due to the change in the energy requirement mechanism of the yeast as a result of yeast metabolism under the effect of high pressure and temperature (19). Aslan et al (2014a) have emphasized that different sources of sugar cause changes in the synthesis of certain vitamins and fatty acids in *S. cerevisiae* (11). Aslan and Can (2014) have emphasize that milk thistle extract is effective in apoptosis mechanism in rats, that it encourages the synthesis of apoptotic proteins and protects the cell against DNA damage (20). Aslan and Can (2015a) have emphasize that GFJ has a protecting for decrease the oxidative damage and increased cell growing and induced protein synthesis in S. cerevisiae culture (8). Aslan and Can (2015b) have emphasize that orange fruit juices has a protective role for decrease the oxidative damage and increased cell growing and stimulating protein synthesis in S. cerevisiae (10). Aslan (2015) have emphasize that different fruit juices and their combination has a protective role for decrease the oxidative damage and increased cell growing in S. cerevisiae (5). In addition Aslan et al (2016a) an Aslan et al (2016b) indicated that milk thistle and black cumin plant has a protective effect on liver and lung (21, 22). Karatay et al (2014a) and Karatay et al (2014b) have emphasized that the almond very important for human health according to its fatty acid and protein contents (23, 24). Park et al (2014) indicated that kiwi extract is more effective in inhibition and treatment of different diseases (1). Soquetta et al (2016) indicated that kiwi fruit reduces the proliferation of some microorganism (2). Wang and Ng (2002) indicated that thaumatin-like protein from kiwi fruits has a preventive effect against to antifungal activity (16). Aslan et al (2015) emphasized that *Nigella sativa* has a protective effect on rat lung damage induced with carbon tetrachloride (25). As can be seen, the positive effects of fruit or vegetable extracts have been observed in studies carried out on yeasts as well as rats. Aslan et al. (2014b) indicated that Pomegranate juice has a vital role for protective effect on S. cerevisiae growth (26), Ozsahin et al. (2009) showed that different sugar sources has positive effects on fatty acid biosynthesis in the S. cerevisiae cell culture (27), Aslan and Can (2017) expressed that lemon juice induces protein expression in S. cerevisiae (28).

Conclusion

According to our results the antioxidant capacity of kiwifruit thus making us think that it can have similar effects on humans like its effects on *S. cerevisiae*. For this aim, we are thinking that similar findings can be acquire for humans when fruits and their juices are consumed orderly.

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Correspondence:
Abdullah Aslan
Firat University, Faculty of Science,
Department of Molecular Biology and Genetics
Elazig-Turkey
Tel: +90 (424) 2370000-3819
Fax: +90 (424) 2330062
E-mail: aaslan@firat.edu.tr